software agent from a computer at one end of a link can be sent out and determine characteristics and optimize/ make systems at other end work with the first one (and not just for this inventions) . This could also be of use for control of video cameras generally

"'Light' as used herein, can be electro-magnetic waves at x-ray through infra -red wavelengths.

Specialized DEFINITIONS used in the application

Target Volume

A "target Volume" is the volume of space (usually a rectangular solid volume) visible to a video camera or a set of video cameras within which a target will be acquired and its position and/or orientation computed.

Interrupt member

An "Interrupt member" is a device that senses a signal to the systems computer allowing a computer program to identify the beginning of one path of a target and the end of the preceding path. It can also identify a function, object, or parameter value. Examples of an Interrupt member are:

1. A given key on the system's keyboard.
2. A voice recognition system capable of acting on a sound or spoken word.
3. A button attached to a game port, serial port, parallel port, special input card, or other input port.
4. A trigger, switch, dial, etc. that can turn on a light or mechanically make visible a new target or sub-target with unique properties of color, shape, and size.

Quant

A "Quant" is a unique discretized or quantized target path (defined by location, orientation, and time information) together with the target's unique identification number (ID). A Quant has an associated ID (identification number). A Quant is composed of a sequence of simple path segments. An example of a Quant that could be used to define command in a CAD drawing system to create a rectangle might be a target sweep to the right punctuated with a short stationary pause followed by an up sweep and pause, a left sweep and pause, a down sweep and pause, and finally ended with a key press on the keyboard. In this example the Quant is stored as a set (4, 1, 2, 3, 4, a, 27) where 4 is the number of path segments, 1-4 are number that identify path segment directions (i.e. right, up, left, down), "a" is the member interrupt (the key press a), and 27 is the target ID. Note that the punctuation that identifies a new path direction could have been a radical change in path direction or target orientation or speed.

Light as used herein includes all electro-magnetic wavelengths from ultraviolet to near infrared

What is claimed is:

1. Apparatus for input by a person of data to a computer having a display comprising

- One or more Datum means provided on said person, said datum means distinguishable in reflected light
- At least one TV Camera having an output
- Means for determining from said TV camera output, the position of said datums and/or the orientation of a portion of said person
- Means for creating on said display, a representation of at least one object, and;

- Means for modifying, manipulating, or positioning said at least one object representation on said screen as a function of the position or orientation of datums or person

2. Apparatus according to claim 1 further including light source means for directing light at said member
3. Apparatus according to claim 1 wherein at least one of said datums is retroreflective
4. Apparatus according to claim 1 wherein at least one of said datums is a natural feature of said member
5. Apparatus according to claim 2 wherein said light source is an LED light source
6. Apparatus according to claim 2 wherein light from said light source is substantially invisible
7. Apparatus according to claim 1 wherein at least one of said datums is distinctive in color
8. Apparatus according to claim 1 wherein at least one of said datums is a distinctive shape
9. Apparatus according to claim 1 wherein at least two cameras are used
10. Apparatus according to claim 9 wherein said cameras provide stereo pair of images of said object
11. Apparatus according to claim 9 wherein said cameras look at different sides of said person
12. Apparatus according to claim 9 wherein said cameras look at different times at said person
13. Apparatus according to claim 1 wherein said cameras are provided with the display
14. Apparatus according to claim 1 including further means of affixing a datum
15. Apparatus according to claim 1 including further voice input means to said computer
16. Apparatus according to claim 1 including further means to allow said camera to see objects associated with said person
17. Apparatus according to claim 1 including bandpass filter means associated with at least one of said cameras

18. **A method by which a person may input data to a computer, the method comprising:**
    - providing a target on said person
    - providing a source of light to create an illumination field;
    - providing at least one TV camera proximate said light source such that the camera can detect reflection of light from said object in said illumination field
    - detecting radiation reflected from said within the illumination field to create at least one tv image containing an image of said person
    - determining from said tv image information concerning the position and/or orientation of said target, and
    - providing a desired input to said computer using said determined information

19. A method according to claim 20 wherein said member contains at least one retroreflective datum
20. A method according to claim 20 wherein said light source is an LED light source
21. A method according to claim 20 wherein said Light source is substantially invisible

22. **A Method for input of information by a person to a computer having a display representing at least one object comprising the steps of**
    - Providing a datum associated with said person
    - Electro-optically determining, the position of at least one datum on said person in 3 dimensions
    - Providing a representation of at least one computer generated virtual object on said display , and
    - Using said determined position or orientation data, manipulating said object displayed by said computer to provide a desired visual display or audio response

23. A method according to claim 24 wherein at least one of said datums is retroreflective
24. A method according to claim 24 wherein said datum is distinctive in color
25. A method according to claim 24 wherein said datum is a distinctive shape
26. A method according to claim 24 wherein at least two cameras are used

27. A method according to claim 24 wherein said cameras provide stereo pair of images of said datum
28. A method according to claim 24 wherein said cameras look at different sides of said datum
29. A method according to claim 24 wherein said cameras are provided with said display
30. A method according to claim 24 including further step of affixing a datum
31. A method according to claim 24 wherein at least one of said datums is a natural object feature
32. A method according to claim 24 including the further step of recognizing voice input
33. A method according to claim 24 including temporary filter means for at least one lens of said cameras
34. A method according to claim 24 including the further step of sensing the gray level image of a portion of said user .
35. A method according to claim 24 including the further step of changing Sound output as a function of said data
36. A method according to claim 24 including the further step of using said display or audio for learning
37. A method according to claim 24 including the further step of analyzing movement of said datum
38. A method according to claim 24 including the further step of determining the position or orientation of a member

39. **Means for aiding the determination of locations of points on a human, comprising**
- means providing decoration for said human, said means easily visible by a TV camera or other electro-optical device,and
- Means for temporarily providing said decoration means on said human

40. Apparatus according to claim 39, wherein said decoration means is retroreflective
41. Apparatus according to claim 39, wherein said decoration is selected from a group comprising rings, bracelets, watches, lipstick, nail polish,
42. Apparatus according to claim 39, wherein said decoration is part of clothing

43. A Method for producing a display based experience for a user comprising the steps of;

- Providing a computer
- Providing a large screen TV display of size greater than 42 inches diagonal, the display being controlled by said computer
- Providing at least one electro-optical sensor having an output
- Processing in said computer said sensor output
- From said processing, determining the position or orientation of a portion of a person and/or object camera, and using said computer,
- Modifying said display to create a response to an action of said person.

44. A method according to claim 44 wherein said display is approximately lifesize.
45. A method according to claim 44 wherein said user touches or points at virtual objects depicted on said display
46. A method according to claim 44 wherein said user pinches, or grips virtual objects depicted on said display
47. A method according to claim 44 wherein said display varies as the users view changes

48. **Method for activity involving an object, comprising the steps of**
49. Providing an object
50. Determining if features can be sensed by a tv camera
51. Affixing special datums to said object where features are required for best sensing results,
52. Recording the locations of features and special datums into a data base.
53. A method according to claim 48 wherein said special datum is easily affixed by hand
54. A method according to claim 48 wherein said special datum is retroreflective
55. A method according to claim 48 wherein said special datum is linear

56. A method according to claim 48 wherein said special datum is curvilinear

57. **A method of providing a game or other human activity comprising**
- Providing an object
- Providing a member attached to said object and movable with respect thereto
- Determining the position or orientation , or change therein, of said member with an electro-optical sensing system
- From said determined position or orientation, or change therein, determining an input parameter to a computer program, and
- Using said program, provide said game or other activity

58. A method according to claim 57 wherein said member is movable by said human

59. Amethod according to claim 57 wherein said member moves as a result of the action of a physical variable

60. Amethod according to claim 57 including the additional step of determining the position or orientation of a portion of said human

61. Amethod according to claim 57 Wherein said sensor is comprised of at least one TV camera

62. Amethod according to claim 57, wherin said position or motion is determined relative to another member or said object

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